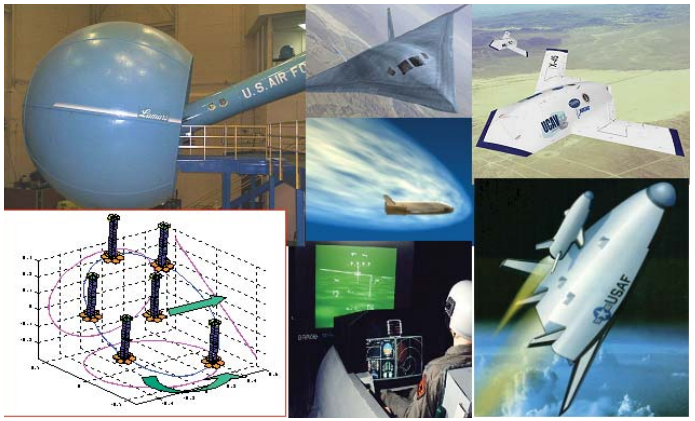
Mission

Plans, manages, and directs basic research and development programs to develop, demonstrate, and transition innovative control technologies. Advances capabilities in control theory, flight control component and system technologies, and flight vehicle simulation and assessment in concert with the Air Vehicle Directorate's focus areas of aircraft sustainment, uninhabited air vehicles, and space access and future strike technology. Transitions technology products to major Air Force commands, other government organizations, industry, and academia through in-house and contracted efforts. Provides consultation and support for Air force operational and development systems. Represents the Air Force in advancement of control science technologies with other national and international agencies and actively participates in professional organizations.

Sim Based R&D

Modeling & Simulation Hierarchy

Maturing technologies and evaluating the military utility of new aerospace concepts through Modeling, Simulation and Analysis.



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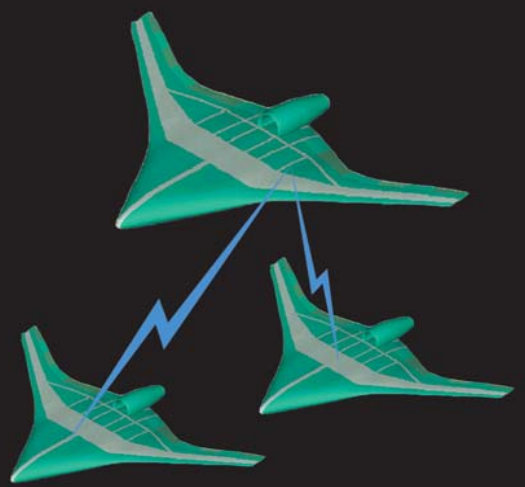


AIR VEHICLES DIRECTORATE

CORE COMPETENCIES

CENTER OF EXCELLENCE

Control Sciences

Basic Research

Control Theory Optimization Branch: Conceives, plans, and conducts Air Force basic research and exploratory development to advance control technology to improve weapon system lethality, survivability, agility, performance, and affordability

- *Robust multivariable control theory*
- *Adaptive, reconfigurable control theory*
- *Autonomous cooperative control theory*
- *Closed-loop flow control*

Control System Architecture/Flight Management

Development & Demonstration

Control Systems Development & Applications Branch: Brings control technologies from basic research and readies them for insertion into demonstrations and transition into Air Force systems. Takes state-of-the-art control technologies and instills the reliability, safety, maintainability, producability, affordability, and supportability required for ensuring future aerospace dominance.

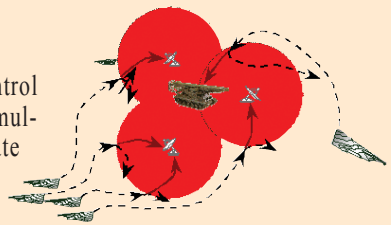
Simulation-Based Research & Development

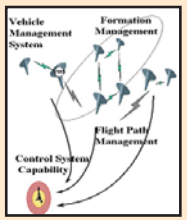
Conceptual Implementation

Control Simulation & Assessment Branch: Develops and applies Simulation Based Research & Development tools and processes to support air vehicle and weapon system technology integration, assessment, demonstration, and transition. Uses virtual and constructive mission-level simulation to assess AFRL and VA technologies encompassing the aerospace vehicle, crew station, subsystems, propulsion system, sensors, and weapons. Assesses mission & combat effectiveness, survivability, flying qualities, flight safety, and workload impact of technologies.

UNMANNED AIR VEHICLES

Develops planning, guidance, and control algorithms to enable multiple UAVs to cooperate autonomously





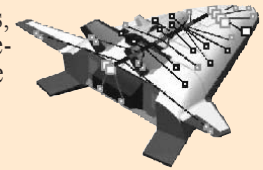
Develops the autonomy required to perform the full spectrum of Air Force missions – enabling fully integrated UAV control systems (hardware, software, and system architecture) to take their place alongside humans in defending our freedoms.

Explores vehicle design space through requirements development and technology assessment. Investigates how UAVs operate in the "To Be Architecture" through manned and unmanned force mix studies and development of concepts of operations (CONOPS) and tactics.

SPACE ACCESS AND FUTURE STRIKE

Develops adaptive guidance and reconfigurable control algorithms for safe and reliable autonomous operation of reusable aerospace launch vehicles

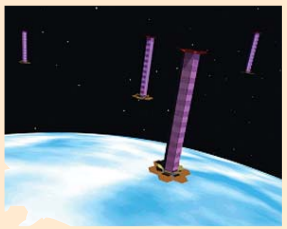
Matures key control technologies for manned and unmanned space access, such as integrated vehicle health management and optical air data, enabling space operations at aircraft tempos with aircraft-level safety, cost, and reliability.

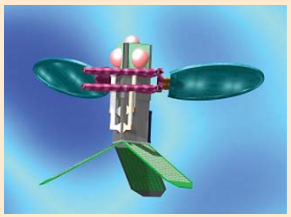


Conducts mission, engagement, and campaign level modeling as needed to demonstrate military utility and guide/prioritize AFRL investment strategies. Concepts being assessed include subsonic, supersonic, transatmospheric, and a subsonic missileer.

SPECIAL RESEARCH

Develops formation control algorithms for maintenance and reconfiguration of satellite clusters to enable distributed space operations





Investigates new areas including bio-inspired control concepts (swarming), adaptive/intelligent systems validation & verification, adaptive aerostructural control, and micro air vehicle control applications.

Supports the SensorCraft ISR concept, conducts mission, engagement, and campaign level modeling as needed to demonstrate *Effectiveness* (trades of sensor suite, aero performance), *Survivability* (LO, real-time mission planning), and *Tactics/CONOPS*.